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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/643,461

08/18/2003

Qi Xiang

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04/06/2010

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EXAMINER

NGUYEN, JOSEPH H

ART UNIT

PAPER NUMBER

2815

MAIL DATE

DELIVERY MODE

04/06/2010

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/643,461	<b>Applicant(s)</b> XIANG ET AL.	
	<b>Examiner</b> JOSEPH NGUYEN	<b>Art Unit</b> 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 February 2010.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 22, 25 and 28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 22, 25 and 28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)         | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election of Species I in FIG.2 including claims 22, 25 and 28 in the reply filed on 02/22/2010 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 22, 25 and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Takahashi (U.S. Publication No. 2004/0002185).

Regarding claims 22, 25 and 28, Takahashi discloses, for example, in FIG. 3 a FET (11b) situated over or on a substrate (12), said FET comprising: a channel (the region located between source/drain regions 17b) situated in said substrate; a gate stack (32b) situated over the channel; a first gate dielectric (20b) situated over said channel, said first gate dielectric having a first coefficient of thermal expansion; a first

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gate electrode (26b) situated over said first gate dielectric, said first gate electrode having a second coefficient of thermal expansion; wherein said second coefficient of thermal expansion is different than said first coefficient of thermal expansion so as to cause all increase in carrier mobility in said FET; a second gate electrode (22b) situated between said first gate electrode and said first gate dielectric, said second gate electrode having a third coefficient of thermal expansion, said third coefficient of thermal expansion being greater than said first coefficient of thermal expansion and said third coefficient of thermal expansion being less than said second coefficient of thermal expansion. See paragraphs [0037] and [0038].

It is noted that Takahashi teaches in paragraphs [0038] and [0059] the first gate dielectric 20b is formed of **silicon oxide**, whose coefficient of thermal expansion is  **$5.0 \times 10^{-7} \text{ }^\circ\text{C}$**  (See Table I, col. 4, lines 40-50 of Gordon et al., U.S. Patent No. 5,557,136, provided herein as evidence only); the first gate electrode 26b is formed of **WSi**, whose coefficient of thermal expansion is  **$6.25 \text{ to } 7.9 \times 10^{-6} \text{ }^\circ\text{C}$**  (Table I of Gordon et al.) and the second gate electrode 22b is formed of **polysilicon**, whose coefficient of thermal expansion is  **$2.9 \times 10^{-6} \text{ }^\circ\text{C}$**  (col. 2, lines 40-42 of You et al., U.S. Patent No. 6,864,556, provided herein as evidence only). Therefore, Takahashi teaches the third coefficient of thermal expansion (**polysilicon**) is greater than the first coefficient of thermal expansion (**silicon oxide**) but less than the second coefficient of thermal expansion (**WSi**). Further, since the structures and materials disclosed by Takahashi meet the claimed invention, Takahashi also discloses the differences between the coefficients of thermal expansion of the gate dielectric, the first gate electrode and the

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second gate electrode would cause an increase in carrier mobility in the FET (nMOSFET) and also cause a tensile strain in the channel, the tensile strain causing the increase in the carrier mobility therein.

### ***Conclusion***

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Nguyen whose telephone number is (571) 272-1734. The examiner can normally be reached on Monday-Friday, 8:30 am- 5:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300 for regular communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Joseph Nguyen/  
Examiner, Art Unit 2815